WORLD INTELLECTUAL PROPERTY ORGANIZATION International Bureau



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6:

A3

(11) International Publication Number:

WO 99/30344

H01J 37/244

(43) International Publication Date:

17 June 1999 (17.06,99)

(21) International Application Number:

PCT/1898/01643

(22) International Filing Date:

19 October 1998 (19,10,98)

(30) Priority Data:

8 December 1997 (08.12.97)

EP

97203839.2

(71) Applicant: PHBLIPS ELECTRON OFFICS B.V. (NL/NL); Achtseweg Noord S, NL-5651 GG Bindhoven (NL).

(72) Inventor: VAN DER MAST, Karel, Diederick; Prof. Hoistlaun 6, NL-5656 AA Eindboven (NL).

(74) Agent: BAKKER, Hendrik: International Octroolburgau B.V. P.O. Box 220, NL-5600 AE Eindhoven (NL).

(81) Designated States: AU, CZ, JP, European patent (AT, BE, CH, CY, DE, DK, ES, PI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

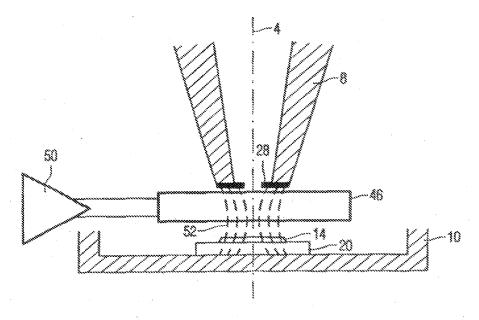
Published

With international search report.

(54) Title: ENVIRONMENTAL SEM WITH MULTIPOLE FIELDS POR IMPROVED SECONDARY ELECTRON DETECTION

(\$7) Abstract

Amphification of the current secondary electrons emanating from the specimen (14) is realized in an ESEM by avalanche-like ionization of the molecules (41) of the gas atmosphere. However, in order to achieve an adequate number of successive ionizations, a comparatively high value of the electric field at the detector electrode (46) is required and, because of the risk of electric breakdowns, the distance between the specimen and the detector electrode may not be smaller than a comparatively large minimum distance. The number of successive ionizations, and bence the current symplification, is thus limited. The invention proposes to configure the electric field of the detector (46, 50), co-operating with the magnetic field (52) of the immersion lens (8) already present in the ionization space, as an



electric multipole field. In the case of electric multipoles, at a given field strength on the optical axis the electric field strength outside the optical axis may be substantially higher. Thus, while influencing the primary electron beam slightly only, a strong detector field can be provided so that the secondary elections to be accelerated receive adequate energy to realize numerous multipole ionizations, and hence a high current amplification in the gas atmosphere around the specimen.